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# TYPICAL FLIES

## A PHOTOGRAPHIC ATLAS OF DIPTERA, INCLUDING APHANIPTERA

BY

E. K. PEARCE

Cambridge University Press
C. F. CLAY, Manager
London: Fetter Lane, E.C.
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1915

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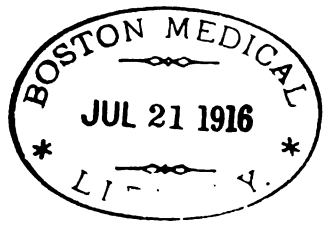


# PREFACE

THE study of Diptera (two-winged flies) is rendered peculiarly difficult by the lack of elementary treatises on the subject. Certain groups are fully treated in the two large (and costly) volumes published by the late Mr Verrall, there are a few scattered papers in various magazines, and one or two monographs (such as Lowne's on the Blowfly); but there is nothing to compare with the numerous manuals dealing with Lepidoptera and Coleoptera, to name two orders only. This little book does not claim to fill the gap, but it is hoped that it may be of some use to the beginner, and attract attention to an order which possesses great interest, and is moreover of much economic importance. It is chiefly a picture book, as pictures appeal more to the eye than many pages of letterpress; and an important dipterous character—the venation of the wings—can be rendered with fidelity in a photograph.

I have found it difficult to obtain specimens set sufficiently flat for photographic reproduction; since, in photographing on the enlarged scale required, no amount of "stopping down" will produce an image sharp all over, unless the subject be fairly in one plane: in addition to this, some species when set and dried shrivel up, and give but a poor idea of their appearance when fresh. This of course chiefly applies to the *bodies* of flies, the wings and legs are not so affected.

Flies may be taken with the usual entomological net, preferably a green one, as less likely to cause alarm than a white one. Mosquito netting, which may be dyed the required colour, is much better than green leno. The net should be fairly large, but light and easily managed, as many flies are very swift and strong on the wing. When caught, the fly may be transferred to a glass bottomed entomological box: a good supply should be carried, and it is better that only one specimen be placed in a box. On returning home the flies may be killed in a laurel bottle, care being taken that the leaves do not

become mildewed, which would probably ruin the specimens; a circular piece of white blotting paper should be placed over the leaves, and frequently renewed. Flies should remain in the bottle till they are thoroughly relaxed, which will require a day or two; if left too long they become rotten and easily break whilst setting. Narrow boards, such as are used for the smallest lepidoptera, will be suitable for large and medium sized flies; small ones may be set on strips of flat cork, covered with thin white paper. Entomological forceps will be needed to insert the pin in the thorax of the fly; I prefer these curved, as they are also useful for moving pinned specimens. If the flies are to be photographed the pin must be cut off as short as possible above the thorax, and the cut end blackened with a touch of "matt black." No. 20 pins will be useful for most flies, though the large species require something stronger, whilst the very small ones, if pinned at all, require the finest silver pins obtainable. Taylor, New Hall Works, Birmingham, will supply a sample card of pins. For setting, strips and triangles of stiff writing paper, to hold legs and wings in place, and a stiff sable paint-brush, a few handled bristles and a fine needle or two, also handled, will do all that is required: a lens is indispensable in setting small flies, and may with advantage be mounted on a simple stand to leave both hands free. Some flies, especially the Tachinidae, are very brittle: care must be taken in manipulating them. Culicidae should be set *and photographed* as quickly as possible, they very soon shrivel. Other flies may remain about ten days on the setting boards. As to numbers, half a dozen specimens should be ample, both sexes being represented, where possible. Fewer will often have to suffice with rare species, and for purposes of photography *one* well set specimen would be sufficient, were it not for the ever present risk of damage in moving from the store box: the slightest touch or jar will often cause the loss of a leg or antenna, and the attempt to replace these is seldom successful.

Store boxes may be had in many sizes (10 × 8 inches is as good as any); whatever size is used should be adhered to, as far as possible, for the sake of uniformity. They should be carefully examined for mites, a great enemy to the collector; even new boxes are sometimes contaminated. In sending flies by post it is well to use two boxes, pinning them well into the inner, and supporting them by extra pins if possible; then packing the box with shavings inside a larger one. The label will of course be *tied* on. When finally pinning flies into the store box it is essential to use a small label giving date and

locality, which can be pinned, written side down, by the same pin as the specimen. The name, etc. of the fly is written on a second label and pinned behind it in the box: the sex should be marked, where known, and a number added to correspond with that in a notebook, where fuller details may be recorded. Flies should be stored in a cool dry place, free from accidental jars and careless handling. Naphthalin wrapped in a piece of net should be pinned in a corner of the box as a guard against mites, the great enemy of the dipterist as of the entomologist in general.

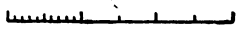
The chief season for collecting in this country is from March till October, the sunny forenoon being the best time. Windy days are very unproductive. Even well-known and good localities are sometimes a blank, from causes we do not know, for flies seem very capricious in their habits. But, like other creatures, they have special haunts where they may usually be found at the proper season, and where they may be expected to occur if carefully searched for. Considerable experience in their habits and localities is needed by the collector. Generally speaking, umbelliferous plants, also bramble, hawthorn and ivy bloom seem to be most attractive. Flies often settle upon gate-posts, railings, and tree-trunks, especially if wounded or decayed. Others frequent salt-marshes and swamps, ponds and river-sides; whilst heath-lands, sheepruns, bare hôt sandy areas and commons attract others. Horse and cattle droppings and decomposing animal and vegetable matter are well-known baits for many species. Others attack living animals, not excepting man; and certain flies prey on insects and spiders. Should horses or cattle be approached for the purpose of taking flies, much care must be exercised, as a net will generally stampede them; it is difficult to employ it to advantage under such conditions.

This little book has received the kind encouragement of many entomologists, among whom I may mention Professor Nuttall and Mr Warburton, both of Cambridge. Much practical help in the selection of species, and information as to types selected and their larvae, has been afforded by the kindness of Professor Theobald, whose assistance, it is hoped, has added greatly to the utility of this book. Thanks are also due to Mr Harwood, of Colchester, for the fine specimens of diptera which he has furnished for the photographs herewith presented. It has not always been possible to do them justice, owing to the difficulties previously noted as besetting the photographer. Mr H. Waddington kindly supplied some fine microscopic slides. The author's brother, Mr N. D. F. Pearce, has also helped with the

illustrations, as to the success of which the reader must be left to judge. Acknowledgement has been made in every case, it is thought, where help has been received: and if this effort is successful it is hoped that it may be some day supplemented by a further series of pictures, to fill a few gaps that were unavoidable in the present volume. The life history (ovum, larva, pupa) of many of the species shown is yet to be traced by entomologists. Measurements are given in every case in millimetres (25 mm. = 1 inch), the first dimension being the length of the fly, and the second the expanse of wings. For various reasons it has not been found possible to reproduce the specimens on one uniform scale: the same difficulty was met with by Dr Michael in illustrating the Oribatidae.

E. K. PEARCE.

BOURNEMOUTH.
*June* 1915.



Scale of 3 centimetres of which one is divided into 10 millimetres.

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# BRAUER'S CLASSIFICATION OF DIPTERA

(* An asterisk denotes that the family is illustrated in this book.)

## Sub-order 1. ORTHORRHAPHA

Larva with a distinct head. Pupa obtected.

The adult escapes from the pupal skin by a straight dorsal slit which may be transverse but is more usually longitudinal. Imago lacks the frontal lunule and ptilinum.

## Sub-order 2. CYCLORRHAPHA

Larva without any distinct head. The Pupa coarctate.

The adult escapes from the puparium through a more or less round opening at the anterior end. Frontal lunule present; ptilinum usually present.

## Sub-order 1. ORTHORRHAPHA

### Section I. NEMATOCERA

Antennae long and thread-like, composed of many similar or very similar segments. The maxillary palpi usually elongate and flexible of from 2 to 5 segments. Second long vein often forked.

### Section II. BRACHYCERA

Antennae usually of three segments, the third usually elongated and sometimes composed of a number of indistinct sub-segments and often bearing a style or arista. Maxillary palpi of 1 to 2 segments, not flexible. Second long vein not forked. Squamae completely concealing the halteres.

1. **THE ORTHORRHAPHA.** Section I, NEMATOCERA contain the following families:

*1. †Pulicidae (Fleas).
*2. Cecidomyidae (Gall Midges).
*3. Mycetophilidae (Fungus Gnats).
*4. Bibionidae (Fever Flies, St Mark's Flies).
*5. Simuliidae (Sand Flies).
*6. Chironomidae (Midges).
7. Orphnephilidae.
8. Psychodidae (Owl Midges).
*9. Culicidae (Mosquitoes).
10. Dixidae.
*11. Ptychopteridae (False Daddy Long Legs).
*12. Limnobiidae (False Daddy Long Legs).
*13. Tipulidae (True Daddy Long Legs).
*14. Rhyphidae (Window Flies).

Section II, BRACHYCERA

*15. Stratiomyidae (Chameleon Flies).
*16. Tabanidae (Gad Flies).
*17. Leptidae (Leptis Flies).
*18. Asilidae (Robber Flies).
*19. Bombylidae.
*20. Therevidae.
21. Scenopinidae.
22. Cyrtidae.
*23. Empidae (Empis Flies).
*24. Dolichopodidae.
25. Lonchopteridae.

2. **THE CYCLORRHAPHA.** Section I, ASCHIZA

Frontal lunule more or less indefinite; no frontal suture.

*26. Platypezidae.
27. Pipunculidae
*28. Syrphidae (Hover Flies).

† These are by some raised to the rank of an order called *Aphaniptera* or *Siphonaptera*, but there is no reason whatever for separating the Fleas or Pulicidae from the Diptera.

Section II. SCHIZOPHORA

Frontal lunule and frontal suture marked.

Sub-section A. MUSCOIDEA

Produce ova as a rule.

Sub-section B. PUPIPARA

Produce fully matured larvae.

Sub-section A. MUSCOIDEA

Series *a.* *Acalyptrata*

Squamae small, not concealing the halteres.

Series *b.* *Calyptrata*

Squamae concealing the halteres.

Section II, SCHIZOPHORA

Sub-section A. MUSCOIDEA. Series *a.* *Acalyptrata*

*29. Conopidae.
*30. Cordyluridae.
31. Phycodromidae.
32. Helomyzidae.
33. Heteroneuridae.
*34. Sciomyzidae.
35. Psilidae.
36. Micropezidae.
37. Ortalidae.
*38. Trypetidae.
39. Lonchaeidae.
40. Sapromyzidae.
41. Opomyzidae.
42. Sepsidae.
43. Piophilidae (Cheese Flies, etc.).
44. Geomyzidae.
45. Ephydridae.
46. Drosophilidae.
*47. Chloropidae (Gout Flies).
48. Milichidae.
49. Agromyzidae.
50. Phytomyzidae.

51. Astiadae.
52. Borboridae.
53. Phoridae.

Sub-section A. MUSCOIDEA. Series *b. Calyptrata.*

*54. Oestridae (Warble Flies).
*55. †Tachinidae (Tachina Flies).
*56. Muscidae (House Flies, etc.).
*57. Anthomyidae (Root-feeding Maggots, etc.).

Sub-section B. PUPIPARA

*58. Hippoboscidae (Forest Flies).
59. Braulidae (Bee Flies).
60. Nycteribidae (Bat Flies).

† The Sarcophaginae and Dexinae are sometimes separated from the Tachinidae as two separate families.

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Fig. 1. *Pulex irritans* Linn. ♀ 4 mm. The human flea, prevalent everywhere. The larvae live in dust and dirt, in crevices of floors, etc.

Fig. 2. *Hystrichopsylla talpae* Curtis. 6 mm. The common mole flea.

Fig. 3. *Trichopsylla styx* Rothsch. ♂ and ♀ 3 mm., from house-martin's nest, Grantchester, Cambridge.

Fig. 4. *Typhlopsylla gracilis* Taschb. ♂ 2 mm. and ♀ 2·2 mm., from a mole's nest, Grantchester.

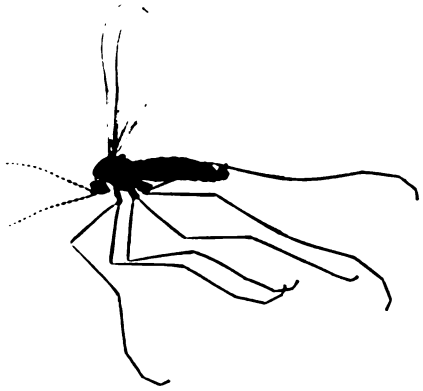


Fig. 5. *Cecidomyia destructor* Say. 2·5 mm. The well-known Hessian fly, destructive to wheat, especially in the United States.

Fig. 6. *Sciara thomae* Linn. ♀ 5·5 × 12 mm. A gregarious fly, common on flowers of Umbelliferae. The larvae feed on plant-roots or on fungi and decaying vegetation.

Fig. 7. *Dilophus febrilis* Linn. ♀ 5 × 11 mm. The Fever fly, very common on Umbelliferae in May and June. The larvae are injurious to the roots of garden crops.

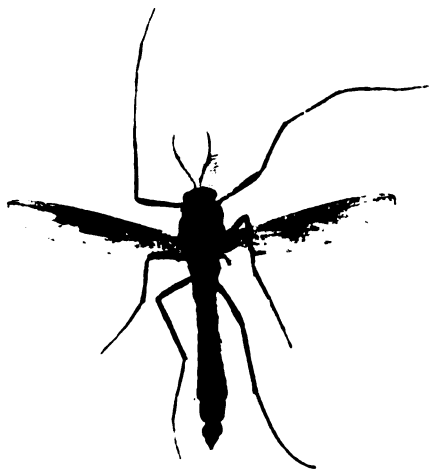
♂

♀

Figs. 8, 9. *Bibio marci* Linn. ♂ 7·5 × 16 mm. and ♀ 11 × 24 mm. St Mark's fly, appearing about St Mark's day and abundant through May. The flies cluster on blossoms but do no harm. The larvae are injurious to roots.

Fig. 10. *Bibio hortulanus* Linn. ♀ 9 × 18 mm. Very common, resting on leaves in gardens in spring. Larvae feed on hops and roots. Flies of this family found as fossils. (Theobald.)

Fig. 11. *Simulium cinereum* Macq. ♀ 3·5 × 8 mm. One of the "Sand flies" of Europe. The adults bite viciously, and are thought to cause Pellagra. Larvae and pupae are aquatic in running water.



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Figs. 12, 13. *Chironomus rufipes* Linn. ♂ 8 × 10·5 mm., ♀ 6 × 12 mm. Hedges and riversides in June. Larvae aquatic, known as "blood-worms," found in rain-barrels and pools.

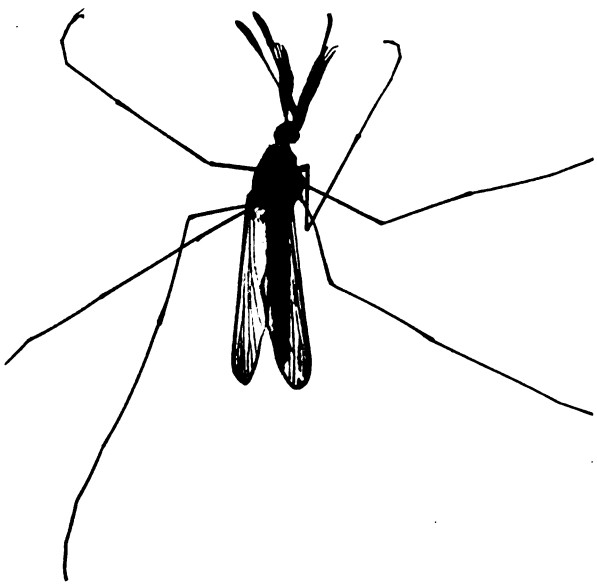


Fig. 14. *Anopheles bifurcatus* Linn. ♂ 6 mm. The female bites, not the male. Larvae and pupae found in stagnant and very slow-running water. The ♀ a carrier of Malaria. (Bournemouth.)

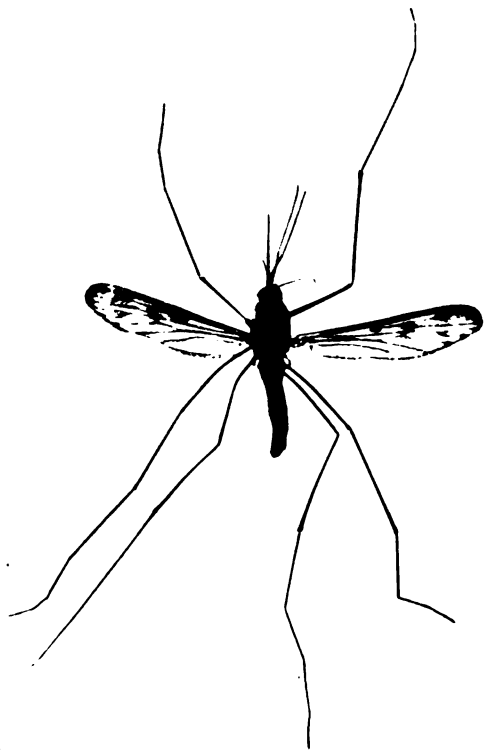


Fig. 15. *Anopheles maculipennis* Meigen. ♀ 4·5 × 10 mm. Common carrier of Malaria in Europe. (Grantchester.)

Fig. 15 B. *A. maculipennis*, larva. 3·5 mm.

Fig. 15 A. *A. maculipennis* emerging from pupa. 5 mm.

Fig. 15 C. *A. maculipennis*, pupa. 4 mm.

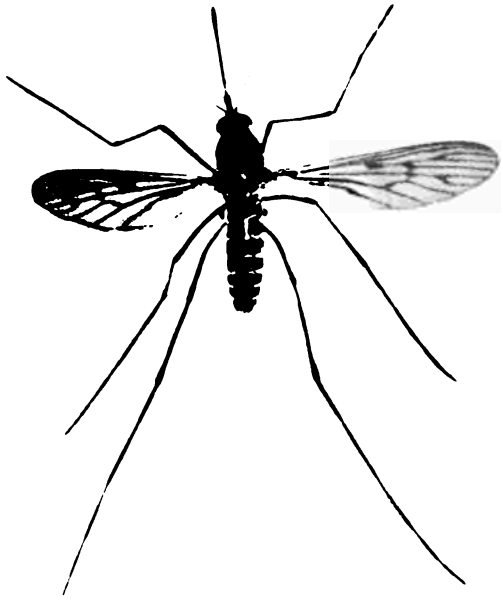


Fig. 16. *Theobaldia annulata* Meig. ♀ 7 × 15 mm. A common British mosquito and a vicious biter, often producing large and painful wheals. The adult female hibernates in cellars, outhouses, etc. Larvae and pupae are aquatic.

Fig. 16 A. *Theobaldia annulata.* ♂ 8 mm. From a micro-slide.

Fig. 17. *Culex cantans* Meig. ♀ 8 × 13 mm. Less generally distributed than Fig. 16, but locally common. Found as a rule in woods and copses, bites viciously at dusk. (Colchester.)

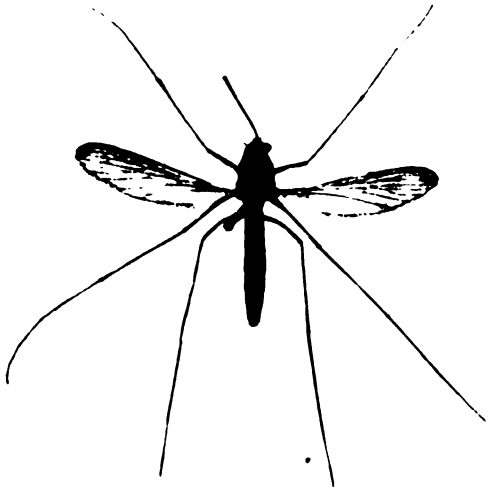


Fig. 18. *Culex pipiens* Linn. ♀ 6 × 12 mm. Perhaps the commonest of the "gnats."

Fig. 18 A. *C. pipiens*, larvae emerging from egg-raft. 2 × 2 mm. (Waddington.)

Fig. 18 B. *C. pipiens* emerging from pupa-case. ♀ 8 mm. (Micro-slide, Waddington.)

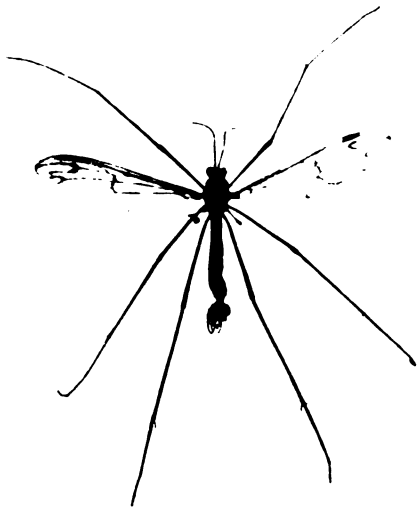


Fig. 19. *Ptychoptera albimana* Falr. ♂ 9½ × 21 mm. Common in damp places in summer. Larvae live in stagnant waters and have a long tube at end of body, which they raise to the surface for breathing.

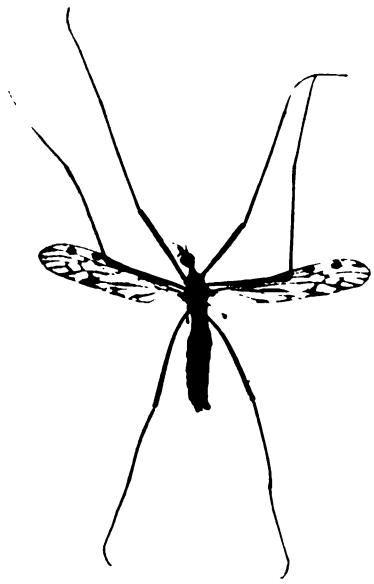


Fig. 20. (Limnobinae) *Limnobia analis* Meig. ♂ 8×18 mm. Found in damp places, larvae live in decaying vegetable matter, especially fungi and wood.

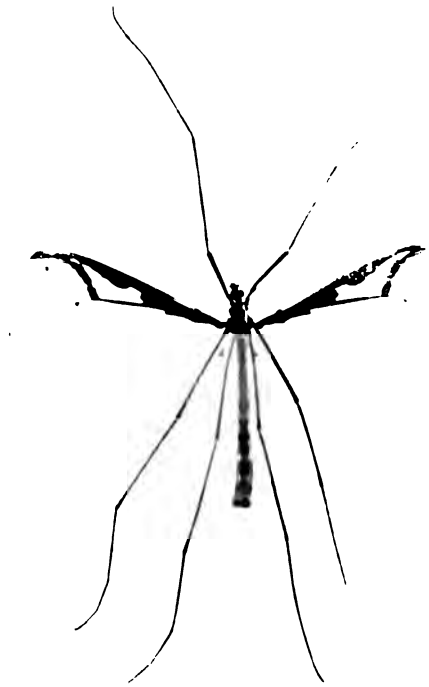


Fig. 21. (Amalopinae) *Pedicia rivosa* Linn. ♂ 24×48 mm. Chiefly in woods and heaths. One of the finest "Daddy long legs." (New Forest.)

Fig. 22. *Pachyrrhina maculosa* Meig. ♂ 12×25 mm. The larvae (called "leather-jackets") live on roots of plants, and are often very injurious.

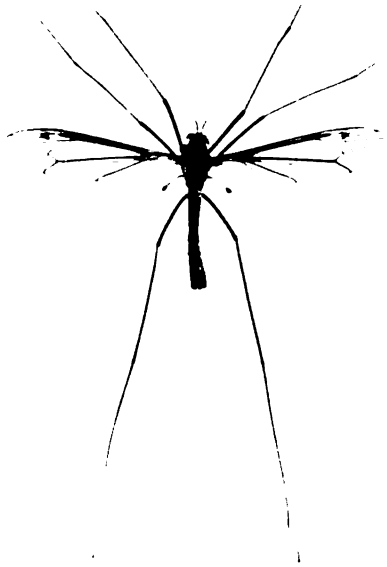


Fig. 23. *Tipula vernalis* Meig. ♂ 11·5 × 32 mm. Common in May in grassy places. The larvae feed on roots of grass, weeds, etc.

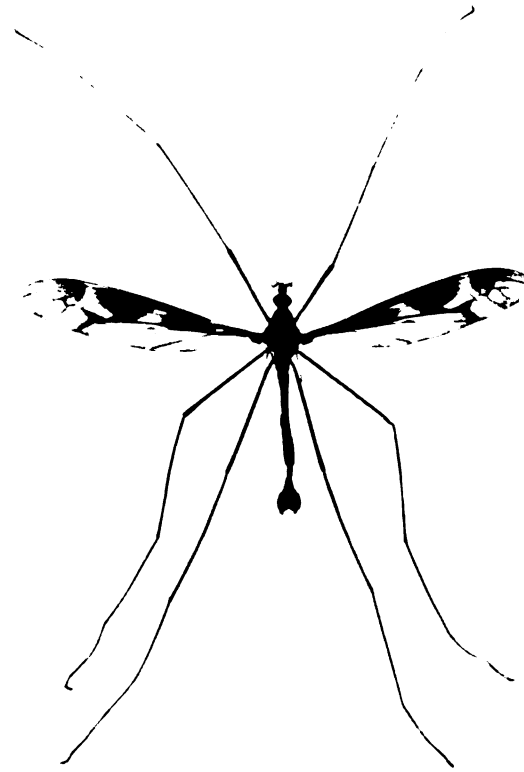
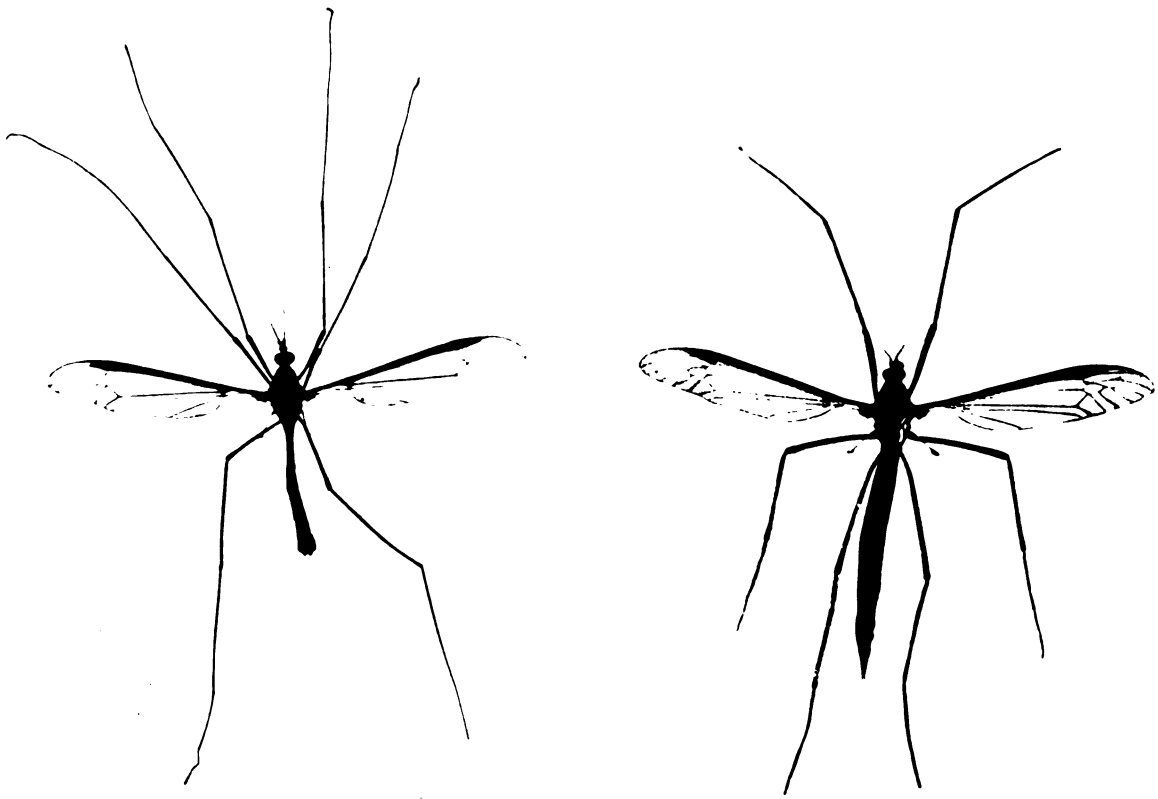


Fig. 24. *Tipula gigantea* Schrank. ♂ 32 × 54 mm. The largest British "Daddy long legs." Fairly common. (Colchester.)



♂ ♀

Figs. 25, 26. *Tipula oleracea* Linn. ♂ 18 × 40 mm., ♀ 22 × 38 mm. The common Crane-fly or Daddy long legs. The larvae are widely known as "leather-jackets," and are highly injurious to various roots, especially in grass lawns.

Fig. 27. *Rhyphus fenestralis* Scopoli. ♀ 5 × 12 mm. Found on windows of houses and outhouses. The larvae live in water, rotting wood and hollow trees, or in manure.

Fig. 28. (Clitellarinae) *Oxycera pulchella* Meig. 8 × 13 mm. Found on leaves in May, not common, larvae occur among confervae on the face of a mill-race dam. (Colchester.)

Fig. 29. (Stratiomyinae) *Stratiomys furcata* Fabr. ♂ 13 × 22 mm. Chiefly on and near aquatic plants; larvae aquatic. (St Osyth.)

Fig. 30. (Sarginae) *Chrysonotus bipunctatus* Scopoli. ♀ 11 × 19 mm. Larvae are found in cow-dung. (New Forest.)

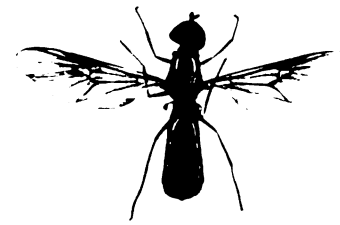


Fig. 31. (Sarginae) *Sargus flavipes* Meig. ♂ 7 × 15 mm. Larvae occur in cow-dung. (Colchester.)

Fig. 32. (Sarginae) *Sargus cuprarius* Linn. ♀ 9×16 mm. Common on leaves in June. Larvae are found in garden mould and in elm sores.

Fig. 33. (Sarginae) *Chloromyia formosa* Scopoli. ♂ 9×17 mm. On leaves of shrubs and flowers. Larvae in garden mould; have been bred from *Brassica rapa*.

Fig. 34. *Haematopota pluvialis* Linn. ♀ 8×17 mm. Commons, riversides, fields and moors, near water, biting vigorously. Known as "Clegs" and "Breeze-flies." They bite men and animals during the hot part of the day. The larvae of Tabanidae occur in damp sand and mud, and are known to attack other larvae. The adult males are rare.

Fig. 35. *Haematopota bluvialis.* ♀.

Fig. 36. *Haematopota pluvialis.* ♂ 7×15 mm.

Fig. 36 A. Typical habitat of *H. pluvialis*. (Wareham Heath.)

Fig. 37. *Haematopota crassicornis* Ohlbg. ♀ 9 × 18 mm. Less common than the preceding: found on posts, railings and herbage in marshy places. (Colchester.)

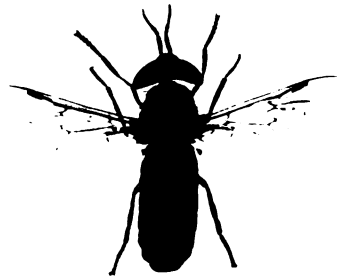


Fig. 38. *Haematopota italica* Meig. ♀ 12 × 22 mm. Chiefly found in Essex; Mersea Island and St Osyth. The three species are difficult of identification. (Alresford.)

JUL 21

Fig. 39. *Tabanus* (*Therioplectes*) *solstitialis* Meig. ♀ 16 × 30 mm. The larvae of Tabanidae live in damp sand and mud, or beneath rotting leaves. They feed on other insects, worms, etc. The eggs are laid in clusters on leaves and stems of plants and on damp rocks.

Fig. 40. *Tabanus* (*Atylotus*) *latistriatus* Brau. ♀ 14 × 26 mm. Rare, found on Essex coast, Mersea Island, and in Dorset. (Essex coast.)

Fig. 41. *Tabanus* (*Atylotus*) *fulvus* Meig. ♀ 13 × 26 mm. Tawny Breeze fly. Fairly common on Essex coast, N. Devon, New Forest, and in Scotland.

Fig. 42. *Tabanus bovinus* Linn. ♀ 22 × 45 mm. Ox Gadfly, terrifying horses and cattle by its bite, and attacking pedestrians. A closely allied species, *T. suedeticus* Zeller, the largest British gadfly, is more common and is often confused with *T. bovinus*. (Lyndhurst.)

♀

♂

Figs. 43, 44. *Chrysops caecutiens* Linn. ♀ 9×19 mm., ♂ 10×18 mm. Sometimes very numerous in woods near water in summer, biting viciously. The large eyes are golden green with spots of purple, and there are three ocelli. Larvae live in mud. The male is very rarely taken.

♀

♂

Figs. 45, 46. *Chrysops relicta* Meig. ♀ 10×19 mm., ♂ 10×18 mm Not uncommon in damp meadows, occurs near Colchester.

Fig. 47.

*Chrysops caecutiens* Linn.

*Chrysops quadrata* Meig.

*Chrysops relicta* Meig.

The abdominal markings afford a ready means of distinguishing these three species.

Fig. 48. *Chrysops sepulcralis* Fabr. Very uncommon. Found on moorland near Bloxworth, Dorset. Specimen taken by Rev. O. Pickard-Cambridge.

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Figs. 49, 50. *Leptis scolopacea* Linn. ♀ 11 × 22 mm., ♂ 12 × 22 mm. Met with on boles of trees, beside rivers and ditches, in early summer. Predatory on insects. Larvae live in earth, and are also predaceous, attacking earthworms and grubs.

Fig. 51. *Leptis tringaria* Linn. ♂ 10 × 21 mm. Local, in damp places, appears in July and August. (Great Horkesley.)

Fig. 52. *Atherix marginata* Falr. ♀ 7 × 18 mm. Found on alders near water, often in dense clusters on shrubs overhanging water where the eggs are deposited under the mass of dead bodies. The larvae fall into the water and have a forked tail. (New Forest.)

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Figs. 53, 54. (Dasypogoninae) *Leptogaster cylindrica* De Geer. ♂ 12 × 13 mm., ♀ 14 × 17 mm. Found by sweeping among grass and bushes, the adult clinging to grass stems.

♂

♀

Figs. 55, 56. (Dasypogoninae) *Dioctria oelandica* Linn. ♂ 13 × 22 mm., ♀ 13 × 26·5 mm. A predatory species which occurs in some numbers on leaves in May. It feeds on Ichneumonidae and other insects. The larvae inhabit moist earth.

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Figs. 57, 58. (Dasypogoninae) *Isopogon brevirostris* Meig. ♂ 8 × 16 mm., ♀ 10 × 20 mm. Generally scarce, prefers hilly and mountainous districts, and dry localities. Larva unknown. (Newbury.)

Fig. 59. (Laphrinae) *Laphria flava* Linn. ♂ 21 × 33 mm. According to Dr Sharp the larva feeds upon dead coleopterous larvae in tree trunks. The adult like all Asilidae is predaceous. (Aberdeen.)

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Figs. 60, 61. (Laphrinae) *Laphria marginata* Linn. ♂ 11 × 17 mm., ♀ 11 × 21 mm. Not uncommon, local, in woods at rest on leaves. Predatory.

♂

♀

Figs. 62, 63. (Asilinae) *Asilus crabroniformis* Linn. ♂ 22 × 38 mm., ♀ 26 × 38 mm. Clings to long grass on heaths, darting away in short flights if disturbed and soon settling again. Feeds on large insects, *e.g. Sarcophaga carnaria.* Has been called the "Wolf-fly." Not uncommon on Wareham Heath, Dorset.

♀

Fig. 64. *A. crabroniformis.* ♀ with wings closed at rest. 26 mm.

Fig. 64 A. Habitat of *A. crabroniformis*, Wareham Road, Dorset.

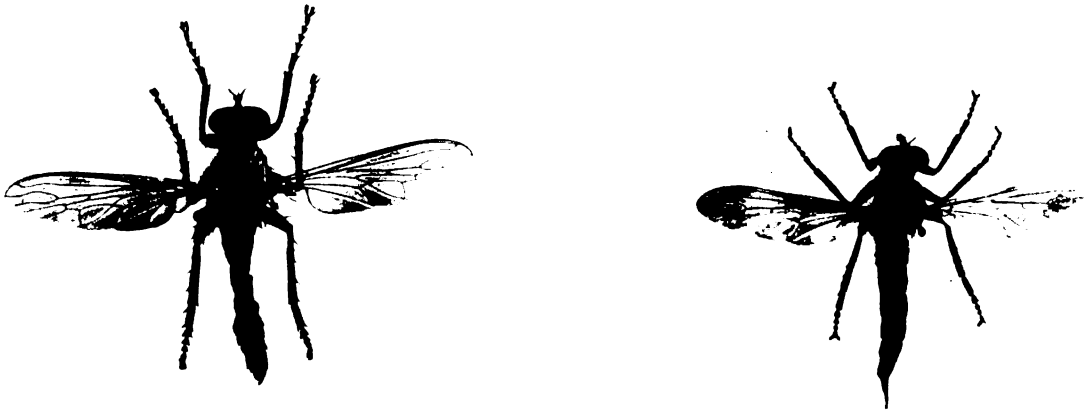
Fig. 64 B. A favourite habitat of *A. crabroniformis*; sandy patches on heath, near Wareham, Dorset.

♂ ♀

Figs. 65, 66. (Asilinae) *Philonicus albiceps* Meig. ♂ 18 × 27 mm., ♀ 17 × 25 mm. Found on East Coast sands, July and August; a large local race at Yarmouth. Preys on flies, grasshoppers, etc. (St Osyth.)

♂ ♀

Figs. 67, 68. (Asilinae) *Neoitamus cyanurus* Loew. ♂ 12 × 23 mm., ♀ 13 × 22 mm. Rests on leaves in woods, preys on small butterflies and other insects.



♂ ♀

Figs. 69, 70. (Asilinae) *Machimus atricapillus* Fln. ♂ 12 × 20 mm., ♀ 15 × 22 mm. Rests on leaves in open spaces in woods, darts on its victims, returning to rest to devour them.

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Figs. 71, 72. (Asilinae) *Dysmachus trigonus* Meig. ♂ 12 × 19 mm., ♀ 12 × 20·5 mm. Seen by Mr Harwood preying on Lucilia, at Clacton-on-Sea. (St Osyth.)

Fig. 73. *Anthrax fenestratus* Fln. 11 × 20·5 mm. The larva of Anthrax is parasitic on lepidoptera (Verrall), locusts and bees (Megachile). (New Forest.)

Fig. 74. *Bombylius discolor* Mik. ♂ 12 × 27 mm. Scarcer than the following; seen on primroses in woods, April and May. Larva parasitic on larvae and pupae of small bees such as Andrena and Halictus. (Colchester.)

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Figs. 75, 76. *Bombylius major* Linn. ♂ 10 × 27 mm., ♀ 12 × 29 mm. Found hovering over primroses and ground ivy, also Salix. Larva lives in the nests of Andrena and other wild bees. Fairly common in early spring. (New Forest.)

Fig. 77. *Thereva nobilitata* Fabr. ♂ 11×17 mm. Frequently seen at rest on leaves of plants, and on dry roadways and paths, in June. Sometimes predatory. The carnivorous larvae live in earth, decaying wood and cow-dung, and devour other larvae.

Fig. 78. *Thereva annulata* Fabr. ♂ 10×18 mm. Common from Cornwall to Sutherland on sand dunes, June to August; the male is commonest. (Clacton-on-Sea.)

♂

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Figs. 79, 80. (Empinae) *Empis tessellata* Fabr. ♂ 10×21 mm., ♀ 11×23 mm. Much attracted by may-blossom and umbelliferous plants: kills and devours many insects. Larvae live in earth, especially under dead leaves, and are carnivorous. Some species also live in decaying wood. (New Forest.)

Fig. 81. *Dolichopus atratus* Meig. ♂ 6 × 11 mm. Predaceous, on surface of water, in forests and damp places; often found on alders. (Newbury.)

Fig. 82. *Poecilobothrus nobilitatus* Linn. ♂ 6 × 12 mm. On low herbage near pools and ditches, also damp places in woods and meadows.

Fig. 83. *Scellus notatus* Fabr. ♂ 7 × 12 mm.

Little is known of larval Dolichopodidae, some live in earth and rotten wood. Those of Medeterus feed on larvae and pupae of Tomicius, probably all are carnivorous. (Theobald.)

Fig. 84. *Platypeza modesta* Zitt. ♂ 3·5 × 8·5 mm. The larvae of Syrphidae mostly feed on aphides and scale insects. (Farmingham.)

Fig. 85. (Syrphinae) *Pipiza noctiluca* Linn. ♀ 7 × 14 mm. On buttercups in May, soon over.

Fig. 86. (Syrphinae) *Orthoneura nobilis* Fln. ♀ 6 × 12 mm. Found in low-lying ditches on ranunculus and Umbelliferae. (Verrall.)

Fig. 87. (Syrphinae) *Chrysogaster splendens* Meig. ♂ 8 × 14 mm. (Colchester.)

Fig. 88. (Syrphinae) *Chilosia sparsa* Loew. ♀ 10 × 18 mm. Frequents meadows and woods.

Fig. 89. (Syrphinae) *Melanostoma mellinum* Linn. ♂ 7 × 14 mm. Larvae found on Umbelliferae, eating aphides.

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Figs. 90, 91. (Syrphinae) *Leucozona lucorum* Linn. ♂ 11 × 22 mm., ♀ 10 × 22 mm. Fairly common on flowers in or near woods. (Silchester.)

Fig. 92. *Ischyrosyrphus glaucius* Linn. ♀ 11 × 24 mm. (Strathkelly.)

Fig. 93. *Didea fasciata* Mcq. ♂ 10 × 19 mm. (N. Kent.)

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Figs. 94, 95. *Catabomba pyrastri* Linn. ♂ 15 × 25 mm., ♀ 14 × 25 mm. Very common on flowers, June to October. The leech-like larvae are valuable allies of the gardener, feeding as they do on aphides and scale insects.

Fig. 96. *Syrphus ribesii* Linn. ♀ 11 × 21 mm. A common "hovering fly" in gardens and woods. The larvae feed upon plant lice as do many Syrphid larvae and are most beneficial.

Fig. 97. *Syrphus nitidicollis* Meig. ♀ 11 × 21 mm. In glades of woods, apparently less common in gardens.

Fig. 98. *Syrphus bifasciatus* Fabr. ♀ 11 × 22 mm. Common in gardens and under shrubs where sunshine penetrates.

Fig. 99. *Syrphus balteatus* De Geer. ♀ 9 × 20 mm. A well-known hoverer, frequents sunny glades, the larva is a great devourer of aphides.

Fig. 100. *Sphaerophoria scripta* Linn. ♂ 11 × 15 mm. Generally distributed, the larvae feed on aphides as do those of most Syrphidae.

Fig. 101. *Xanthogramma ornatum* Meig. ♂ 10 × 20 mm. Not uncommon in June on leaves and flowers.

Fig. 102. *Baccha elongata* Fabr. ♀ 10× 16 mm. Found in woods and fields in May, easily missed, on low herbage.

Fig. 103. *Ascia podagrica* Fabr. ♀ 6 × 10·5 mm. (Colchester.)

Fig. 104. *Rhingia campestris* Meig. ♀ 9 × 19 mm. Amongst flowers in gardens and fields, quite common.

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Figs. 105, 106. (Volucellinae) *Volucella bombylans* Linn. ♂ 15 × 31 mm., ♀ 15 × 30 mm. (Yellow form.) Partial to brambles and other flowers, June and July, a variable species. The larvae live in nests of bees, especially *B. lapidarius* and *B. derhannellus*, the flies having a red tail, in those of *B. hortorum* and *B. jonellus*, the flies having a white tail. (Theobald.)

Fig. 107. (Volucellinae) *Volucella pellucens* Linn. ♀ 16 × 32 mm. Seen on briar hedges, Bournemouth. The larva lives in bumble-bees' nests.

Fig. 108. (Eristalinae) *Eristalis tenax* Linn. ♂ 15 × 28 mm. The common "Drone-fly," hovering over flowers. The larva or "rat-tailed maggot" lives in foul pools and ditches.

Fig. 109. (Eristalinae) *Eristalis arbustorum* Linn. ♂ 10 × 12 mm. Found in gardens amongst flowers, and on banks.

Fig. 110. (Eristalinae) *Helophilus pendulus* Linn. ♂ 11 × 20 mm. The aquatic larvae are found in sunny pools and dykes.

Fig. 111. (Eristalinae) *Merodon equestris* Fabr. ♀ 13 × 24 mm. Resting in paths near beds of bulbs, narcissi, etc.; also near wild hyacinths in woods. The larvae live in bulbs, and are very injurious; their presence must be reported to the Board of Agriculture. (Colchester.)

Fig. 112. (Milesinae) *Tropidia scita* Harr. ♂ 8 × 14 mm. Grassy meadows and fenlands. (Verrall.) (Arlesford.)

Fig. 113. (Milesinae) *Criorrhina ranunculi* Pg. ♀ 17 × 29 mm. Generally flies high up, occasionally settles on hawthorn. (New Forest.)

Fig. 114. (Milesinae) *Criorrhina oxyacanthae* Meig. ♀ 12 × 23 mm. At hawthorn, raspberry and other flowers in May. (Newbury.)

Fig. 115. (Milesinae) *Xylota lenta* Meig. ♀ 11 × 21 mm. Found alighting on various flowers.

Fig. 116. (Milesinae) *Eumerus strigatus* Fln. ♀ 6·5 × 12 mm. The larva attacks bulbs, and is often as harmful as Merodon in narcissi. Verrall says it has been bred from onions.

Fig. 117. (Milesinae) *Chrysochlamys cuprea* Scopoli. ♀ 12 × 23 mm. Found chiefly in proximity of trees.

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Figs. 118, 119. (Milesinae) *Sericomyia borealis* Fln. ♂ 16 × 30 mm., ♀ 16 × 29 mm. Verrall mentions the "singing" of the male fly. On commons, moors and heaths in the North, and on Dartmoor. (Inverurie and from Aberdeen.)

Fig. 120. (Chrysotoxinae) *Chrysotoxum cautum* Harr. ♀ 14 × 28 mm. Walker says the larvae feed on roots of plants.

Fig. 121. (Conopinae) *Conops flavipes* Linn. ♀ 11 × 18 mm. The larvae of all Conops are parasitic in larvae of wasps and bumble-bees, and emerge from the pupae as perfect insects. (New Forest.)

Fig. 122. (Conopinae) *Physocephala rufipes* Fabr. 12 × 18 mm. (Colchester.)

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Figs. 123, 124. (Myopinae) *Sicus ferrugineus* Linn. ♂ 9 × 14 mm., ♀ 11 × 16 mm. A rather late fly, appearing in August; parasitic on insects.

Fig. 125. (Myopinae) *Myopa buccata* Linn. ♀ 10 × 17 mm. Parasitic on insects, found about May on flowers.

Fig. 126. (Oestridae) *Gastrophilus equi* Fabr. ♂ 12 × 21 mm.

Fig. 127. ♀.

Fig. 127 A. (Micro-slide) greatly enlarged.

Figs. 126, 127. (Oestridae) *Gastrophilus equi* Fabr. ♂ 12 × 21 mm., ♀ 24 × 27 mm. The well-known Horse Botfly. The young larvae are swallowed by the horse licking its legs, where the eggs (Fig. 127 A) are placed. The larvae or bots live in the stomach. The egg measures 1·2 mm. (Gt Horkesley.)

Fig. 128. (Oestridae) *Hypoderma lineatum* Villiers. ♂ 13 mm. One of the two "Ox Warble flies," causing sores known as "warbles" by the presence of its larvae on backs and flanks of cattle. The eggs are laid on legs and larvae enter via skin and crawl to the back (Theobald). Man is also occasionally attacked. (New Forest.)

Fig. 129. (Oestridae) *Hypoderma bovis* De Geer. Stouter and larger than the preceding: destructive to cattle hides and meat. Carpenter says it is commoner in Ireland than in England. Life history similar to *H. lineatum*. (New Forest.)

Fig. 130. (Oestridae) *Oestrus ovis* Linn. 11 mm. The "Sheep nostril fly," deposits eggs or larvae in nostrils of sheep. The maggots live in the nose, and penetrate the bony cavities of the skull. (Specimen from Cambridge Museum.)

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Figs. 131, 132. (Tachinidae) *Alophora hemiptera* Fabr. ♂ 12×23 mm., ♀ 9×17 mm. In fields on Umbelliferae at end of summer. Female has clear wings, male clouded and dark. (New Forest, near Matley Bog.)

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Figs. 133, 134. (Sarcophagidae) *Sarcophaga carnaria* Linn. ♂ 14×25 mm., ♀ 11×23 mm. One of the commonest British "Flesh flies." Will lay its eggs on wounds.

Fig. 135. (Muscidae) *Stomoxys calcitrans* Linn. ♀ 7 × 16·5 mm. The common "Stable fly" or "Storm fly," biting in houses in summer and autumn. Carries disease. Larva lives in decaying vegetables.

Fig. 136. (Muscidae) *Haematobia irritans* Linn. ♀ 5 × 9 mm. Annoys horses and cattle. (Milford Haven.)

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Figs. 137, 138. (Muscidae) *Musca domestica* Linn. ♂ 6·5 × 13 mm., ♀ 8 × 15 mm. Everywhere abundant in houses, carries typhoid and other disease germs. The larva lives in horse manure, spent hops and excrement.

Fig. 139. (Muscidae) *Calliphora vomitoria* Linn. ♀ 12 × 25 mm. One of the well-known "Blue bottle flies."

Fig. 140. (Muscidae) *Lucilia sericata* Meig. ♂ 8 × 15 mm. The "Sheep maggot fly," whose larvae burrow into the flesh of sheep, and cause the wool to fall off. One fly is said to produce 500 eggs.

Fig. 141. (Anthomyidae) *Spilogaster platyptera* Ztt. ♂ 7 × 15 mm. Said to be new to Britain. Bred from débris of hornets' nest by Mr Harwood, Colchester.

Fig. 142. (Anthomyidae) *Hylemyia coarctata* Fln. ♂ 6 × 12 mm. The "Wheat bulb fly," which lays eggs on young wheat, which the larvae destroy. (Theobald.) Specimen from Thames marshes.

Fig. 143. (Anthomyidae) *Anthomyia radicum* Linn. ♂ 5 × 11 mm. Larvae are very destructive to radishes, cabbage roots, etc. (Hythe.)

Fig. 144. (Anthomyidae) *Phorbia cepetorum* Meade. ♀ 7 × 13 mm. The "Onion fly." The larvae often do great harm to the onion crops all over the country, and are called the "Onion maggot."

Fig. 145. (Anthomyidae) *Pegomyia betae* Curtis. ♂ 5·5 × 12 mm. The "Mangold fly," sometimes very injurious to mangold and beet crops. Lays eggs under the leaves of young plants, and the larvae tunnel into the leaves.

Fig. 146. (Homalomyinae) *Homalomyia canicularis* Linn. ♂ 7 × 13 mm. The smallest of the common summer house-flies. Male more abundant than female.

Fig. 147. (Cordyluridae) *Scatophaga stercoraria* Linn. ♀ 7 × 17 mm. The well-known "Dung fly," laying its eggs in droppings of cattle and horses.

Figs. 148, 149. (Sciomyzidae) *Tetanocera punctata* Fabr. ♀ 5 × 11 mm. Frequents aquatic plants and Compositae. (Grantchester.)

Fig. 150. (Ortalidae) *Platystoma seminationis* Fabr.
♀ 5 × 12 mm. (Colchester.)

Fig. 151. (Trypetidae) *Acidia heraclei* Linn.
♀ 4 × 11 mm. The well-known "Celery fly." The larvae tunnel in celery and parsnip leaves, forming blisters.

Fig. 152. (Chloropidae) *Chlorops taeniopus* Meig. 5 × 8 mm. The "Gout fly." Destructive to barley.

Fig. 153. *Hippobosca equina* Linn. ♀ 6 × 16 mm. The "Forest fly," crawling on horses, in the New Forest especially, and terrifying them. The female produces her young matured as a "puparium." (New Forest.)

Fig. 154. *Ornithomyia avicularia* Linn. 5 × 15 mm. Parasitic on fowls, thrushes, blackbirds, etc.

Fig. 155. *Melophagus ovinus* Linn. 6 mm. Known as the "Ked," or "Spider fly," greatly irritating sheep. The larva is hatched in the body of the fly (which is apterous) and changes to the pupal state at once.

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